

NOISE IMPACT ANALYSIS
THE PASEOS AT FOOTHILL RANCH VILLAGE PROJECT
CITY OF LAKE FOREST, CA

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PROJECT LOCATION & DESCRIPTION

The Paseos at Foothill Ranch Village is located in the Foothill Ranch community in the city of Lake Forest (Figure 1). The project site consists of 7.01 gross acres bounded by Towne Centre Drive on the south and Auto Center Drive on the east, west, and north. Surrounding land uses consist of commercial and light industrial uses. Commercial retail centers are present to the west (including the Foothill Ranch Towne Centre on the opposite side of Bake Parkway), a Mercedes-Benz auto dealership is present to the northeast, and light industrial/office uses are present north of Portola Parkway and along the south side of Towne Centre Drive. A former auto dealership and vacant parcel are to the northwest.

The project will contain up to 75 single-family detached homes (see site plan in Figure 2). Five floorplans are proposed, ranging from 1,736 to 2,240 square feet and with 3 to 4 bedrooms. Overall project density is 10.7 dwelling units per gross acre. Each home would front on a common walkway and landscaped area. Walkways will connect each residence to all areas in the community, including a centrally-located recreation and gathering area (Figure 3) and surrounding offsite sidewalks. The project will include two gated entries, both off of Auto Center Drive. The entries will be connected to each other via on-site private drives. The private drive will offer access to a total of 231 on-site parking spaces. The community is planned to be walkable, allowing for easy connections to nearby retail, entertainment, service, office, and recreational uses.

NOISE SETTING

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally considered to be unwanted sound. Sound is characterized by various parameters that describe the rate of oscillation of sound waves, the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound. In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level.

The decibel (dB) scale is used to quantify sound pressure levels. Although decibels are most commonly associated with sound, “dB” is a generic descriptor that is equal to ten times the logarithmic ratio of any physical parameter versus some reference quantity. For sound, the reference level is the faintest sound detectable by a young person with good auditory acuity.

Since the human ear is not equally sensitive to all sound frequencies within the entire auditory spectrum, human response is factored into sound descriptions by weighting sounds within the range of maximum human sensitivity more heavily in a process called “A-weighting,” written as dBA. Any further reference in this discussion to decibels written as “” should be understood to be A-weighted.

Time variations in noise exposure are typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called Leq), or alternately, as a statistical description of the sound pressure level that is exceeded over some fraction of a given observation period. Finally, because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dB

increment be added to quiet time noise levels in a 24-hour noise descriptor called the Ldn (day-night) or the Community Noise Equivalent Level (CNEL). The CNEL metric has gradually replaced the Ldn factor, but the two descriptors are essentially identical.

Figure 1
Project Location



CNEL-based standards are generally applied to transportation-related sources because local jurisdictions are pre-empted from exercising direct noise control over vehicles on public streets, aircraft, trains, etc. The City of Lake Forest therefore regulates the traffic noise exposure of the receiving property through land use controls.

Noise/land use compatibility standards for various classes of land uses are generally expressed in the Safety and Noise Element of the General Plan to insure that noise exposure is considered in any development decisions. The City of Lake Forest has guidelines for noise exposure standards which are shown in Table 1. For residential uses such as The Paseos project, the City recommends an exterior noise exposure of 65 dB CNEL and interior noise exposure of 45 dB CNEL.

For “stationary” noise sources such as mechanical equipment (pool pumps, air conditioners, etc.) the City does have legal authority to establish noise performance standards designed to not adversely impact adjoining residential uses. These standards are typically articulated in the jurisdictional Municipal Code. These standards recognize the varying noise sensitivity of both transmitting and receiving land uses. The property line noise performance standards are normally structured according to land use and time of day.

**Figure 2
Site Plan**



Figure 3
Conceptual Recreation Center

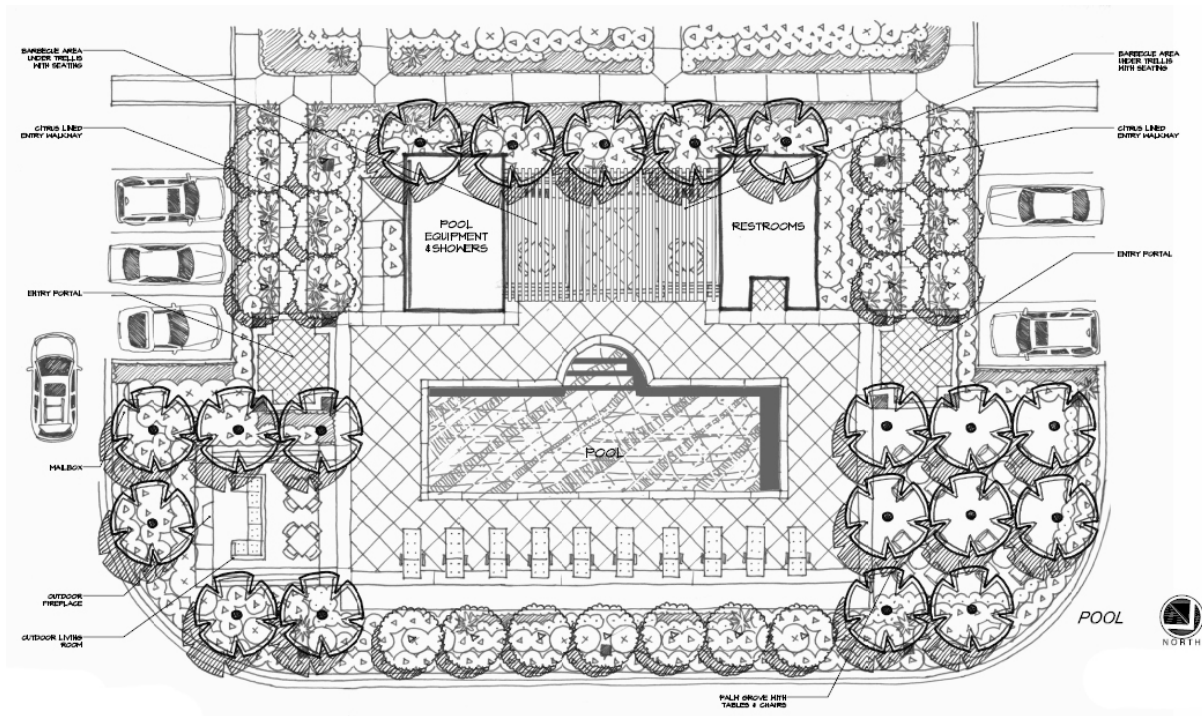


Table 1

City of Lake Forest Interior and Exterior Noise Standards
(General Plan Safety and Noise Element)

Land Use	Noise Standards ¹	
	Interior ^{2,3}	Exterior
Residential - Single-family, multi-family, duplex, mobile home	CNEL 45 dB	CNEL 65 dB ⁴
Residential - Transient lodging hotels, motels, nursing homes, hospitals	CNEL 45 dB	CNEL 65 dB ⁴
Private offices, church sanctuaries, libraries, board rooms, conference rooms, theaters, auditoriums, concert halls, meeting halls, etc.	Leq(12) 45 dB(A) ⁽⁶⁾²	—
Schools	Leq(12) 45 dB(A)	CNEL 65dB ⁽⁵⁾
General offices, reception, clerical, etc.	Leq(12) 50 dB(A)	—
Bank lobby, retail store, restaurant, typing pool, etc.	Leq(12) 55 dB(A)	—
Manufacturing, kitchen, warehousing, etc.	Leq(12) 65dB(A)	—
Parks, playgrounds	—	CNEL 65 dB ⁽⁵⁾
Golf courses, outdoor spectator sports, amusement parks	—	CNEL 70 dB ⁽⁵⁾
<p>Notes:</p> <p>1 CNEL - Community Noise Equivalent Level Leq(12) - The A-weighted equivalent sound level averaged over a 12-hour period (usually the hours of operation).</p> <p>2 Noise standard with windows closed. Mechanical ventilation shall be provided per UBC requirements to provide a habitable environment.</p> <p>3 Indoor environment excluding bathrooms, toilets, closets, and corridors.</p> <p>4 Outdoor environment limited to rear yard of single-family homes, multi-family patios and balconies (with a depth of 6' or more) and common recreation areas.</p> <p>5 Outdoor environment limited to playground areas, picnic areas, and other areas of frequent human use.</p> <p>6 Religious institutions (Churches, temples, and other places of worship) of a small size (occupancy of 100 persons or less) may occupy existing buildings within areas of exterior noise levels ranging from 65 to 75 dB CNEL without providing additional noise insulation for the building.</p> <p>Source: City of Lake Forest General Plan, July 11, 1995.</p>		

CITY OF LAKE FOREST NOISE STANDARDS

The City Noise Ordinance (Chapter 11.16 of the City's Municipal Code), is designed to protect people from non-transportation (stationary) noise. The Noise Ordinance for the City of Lake Forest sets limits on the level and the duration of time a stationary noise source may impact an adjoining residential use.

Ordinance limits generally apply to "stationary" sources such as mechanical equipment, or vehicles operating on private property. The City's noise ordinance limits are stated in terms of a 30-minute limit with allowable deviations from this 50th percentile standard. The louder the level becomes, the shorter the time becomes that it is allowed to occur. Table 2 lists the noise level and the maximum cumulative period of time that the noise level may occur during a 1-hour period.

The Noise Ordinance identifies specific activities that would be exempt from the provisions of the noise restrictions. Exempted activities include, but are not limited to, construction, repair, remodeling and grading, provided such activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a federal holiday.

The standards in Table 2 apply at any residential property line. Therefore, this analysis applies the noise standards in Table 2 in considering the potential noise impacts of existing commercial uses and traffic noise on the proposed Paseos at Foothill Ranch Village project.

Table 2
Lake Forest Noise Ordinance Standards

Noise Level ^a		Maximum Cumulative Duration
DAYTIME ORDINANCE (7 a.m. - 10 p.m.)		
Exterior Noise	Interior Noise	
75 dBA	65 dBA	Not to be exceeded at any time
70 dBA	60 dBA	1 minute
65 dBA	55 dBA	5 minutes
60 dBA	—	15 minutes
55 dBA	—	30 minutes
NIGHTTIME ORDINANCE (10 p.m. - 7 a.m.)		
70 dBA	55 dBA	Not to be exceeded at any time
65 dBA	50 dBA	1 minute
60 dBA	45 dBA	5 minutes
55 dBA	—	15 minutes
50 dBA	—	30 minutes
<p>Source: City of Lake Forest Municipal Code, Section 11.16, Noise Control.</p> <p>a. In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the noise levels shall be reduced by 5 dBA.</p>		

BASELINE NOISE LEVELS

Noise measurements were made in order to document existing baseline levels in the area. These help to serve as a basis to determine noise exposure from ambient noise activities upon the proposed project. Long term (24-hour) noise measurements were conducted on Wednesday, March 14, to Thursday, March 15, 2012, at two on-site locations. The measurement at one location was repeated on Tuesday, March 20, through Wednesday, March 21, 2012.

Long-term noise measurement locations were selected to document the daily trend in noise levels generated by the existing Mercedes Dealership (along Auto Center Drive) just north of the project site and traffic noise from Towne Centre Drive traffic to the south of the proposed site. Measurement locations are shown in Figure 4. The monitoring results from these locations are provided in Table 3.

The noise meters yielded CNEL noise levels of 57-58.5 dB along the site perimeter near the Mercedes Dealership and 56 dB CNEL along the site perimeter adjacent to Towne Centre Drive. These noise levels are well within Lake Forest residential noise standards of 65 dB CNEL. It is therefore unlikely that noise protection will be necessary, even for perimeter units, at The Paseos at Foothill Ranch Village.

Figure 4
Noise Monitor Locations
The Paseos at Foothill Ranch Village



Meter Location

Meter 1: North side of site, just south of existing Mercedes Dealership

Meter 2: South side of site, north of Towne Centre Drive.

Table 3 Noise Measurements

Existing Hourly Leq's

Time Interval	dB Leqs Site 1 March 14-15, 2012	dB Leqs Site 1 March 20-21, 2012	dB Leqs Site 2 March 14-15, 2012
15:00-16:00	52.8	50.4	53.7
16:00-17:00	54.8	54.7	54.6
17:00-18:00	54.5	54.2	55.2
18:00-19:00	58.7	49.0	54.7
19:00-20:00	53.1	49.0	53.5
20:00-21:00	50.4	46.4	53.3
21:00-22:00	47.4	47.6	49.8
22:00-23:00	45.2	47.7	46.7
23:00-24:00	43.1	44.0	43.0
0:00-1:00	43.9	42.5	42.4
1:00-2:00	41.8	41.0	39.1
2:00-3:00	42.2	39.6	38.3
3:00-4:00	42.1	43.7	38.4
4:00-5:00	57.2	44.9	43.1
5:00-6:00	45.2	51.3	50.7
6:00-7:00	49.2	58.3	50.4
7:00-8:00	53.6	64.5	59.6
8:00-9:00	53.7	57.9	55.5
9:00-10:00	53.9	54.2	55.1
10:00-11:00	52.5	48.0	55.2
11:00-12:00	49.4	56.0	54.7
12:00-13:00	54.3	59.0	56.3
13:00-14:00	52.4	55.0	54.5
14:00-15:00	52.9	54.9	55.0

Resultant CNEL

Measurement Parameter	Site 1 March 14-15, 2012	Site 1 March 20-21, 2012	Site 2 March 14-15, 2012
24-Hour dB CNEL	57.0	58.5	56.0

NOISE IMPACTS

NOISE SIGNIFICANCE CRITERIA

Noise impacts are considered significant if they result in:

- a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
- c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

STANDARDS OF SIGNIFICANCE

Noise impacts are considered significant if they expose persons to levels in excess of standards established in local general plans or noise ordinances. The exterior noise standard for the City of Lake Forest for residential uses is 65 dB CNEL in usable outdoor space such as backyards, decks, patios, etc. The inability to achieve this goal through the application of reasonably available mitigation measures would be considered a significant impact.

Impacts may also be significant if they create either a substantial permanent or temporary increase. The term “substantial” is not quantified by CEQA. In most environmental analyses, “substantial” is taken to mean a level that is clearly perceptible to humans. In practice, this is at least a 3 dB increase. Some agencies, such as Caltrans, require substantial increases to be 10 dB or more if noise standards are not exceeded by the increase. For purposes of this analysis, a 3 dB increase is considered a substantial increase. The following noise impacts due to project-related traffic would be considered significant:

1. If construction activities were to audibly intrude into adjacent residential areas during periods of heightened noise sensitivity.
2. If project traffic noise were to cause an increase by a perceptible amount (+3 dB CNEL) on any roadway segment adjacent to a noise sensitive land use.
3. If future, with-project noise levels were to expose receivers to levels exceeding City of Lake Forest General Plan Safety & Noise Element noise standards shown in Table 1.
4. If future, with-project noise levels were to expose receivers to levels exceeding City of Lake Forest Noise Ordinance standards shown in Table 2.

CONSTRUCTION NOISE IMPACTS

Temporary construction noise impacts will vary markedly because the noise strength of construction equipment ranges widely as a function of the equipment used and its activity level. Short-term construction noise impacts tend to occur in discrete phases dominated initially by demolition of existing structures and large earth-moving sources, then by foundation and parking lot construction, and finally for finish construction. The demolition and earth-moving sources are the noisiest, with equipment noise typically ranging from 75 to 90 dB at 50 feet from the source.

Figure 5 shows the range of noise emissions for various pieces of construction equipment. Point sources of noise emissions are attenuated by a factor of 6 dB per doubling of distance through geometrical (spherical) spreading of sound waves. The quieter noise sources will drop to a 65 dB exterior/45 dB interior noise level by about 200 feet from the source while the loudest may require over 1,000 feet from the source to reduce the 90+ dB source strength to a generally acceptable 65 dB exterior exposure level. This estimate assumes a clear line-of-sight from the source to the receiver. Variations in terrain elevation or existing structures will act as noise barriers that may interrupt equipment noise propagation. Construction noise impacts are, therefore, somewhat less than that predicted under idealized input conditions

There are currently no noise-sensitive receivers within 1,000 feet of planned construction activities. There are, however, residential uses proposed for the adjacent lot to the north and west of the proposed Trumark development. If the nearby residential project proceeds in development more rapidly than the Trumark project, there could be nearby noise-sensitive land uses that would be impacted by the Trumark project's construction. FHWA has developed a construction activity noise model that is an industry standard for assessing construction activity noise impacts.

Quantitatively, the primary noise prediction equation is expressed as follows for the hourly average noise level (L_{eq}) at distance D between the source and receiver (dB):

$$L_{eq} = L_{max} @ 50' - 20 \log (D/50') + 10 \log (U.F.\%/100) - I.L.(bar)$$

Where:

$L_{max} @ 50'$ is the published reference noise level at 50 feet

U.F.% is the usage factor for full power operation per hour

I.L.(bar) is the insertion loss for intervening barriers

Published reference noise levels for heavy construction equipment used in clearing, excavation and grading include the following:

Dozers	85 dB
Tractors	80 dB
Backhoes	86 dB
Excavators	86 dB
Graders	86 dB

Source: Noise Control for Buildings..., BBN, 1987

Assuming three large pieces of equipment operate in close proximity, their combined Lmax reference level is 91 dB at 50 feet. Under a clear line of sight and a typical usage factor of 40 percent, the hourly noise level as a function of distance is as follows:

Distance to Source	Hourly Level
100 feet	81 dB
200 feet	75 dB
320 feet	71 dB
400 feet	69 dB
500 feet	67 dB
640 feet	65 dB
800 feet	63 dB
1000 feet	61 dB

Levels of 65 dB can interfere with comfortable conversation and levels of 75 dB can intrude into quiet interior activities such as reading or children napping even with closed windows. Except in limited locations, noise levels in any already completed residential developments will not exceed 75 dB Leq during construction. Outdoor levels of 65 dB may extend further into adjacent noise-sensitive uses, but completed structures and perimeter walls will reduce the construction noise footprint. City policy is therefore to restrict construction activities involving heavy equipment to hours of lesser residential sensitivity if occupied residences are nearby.

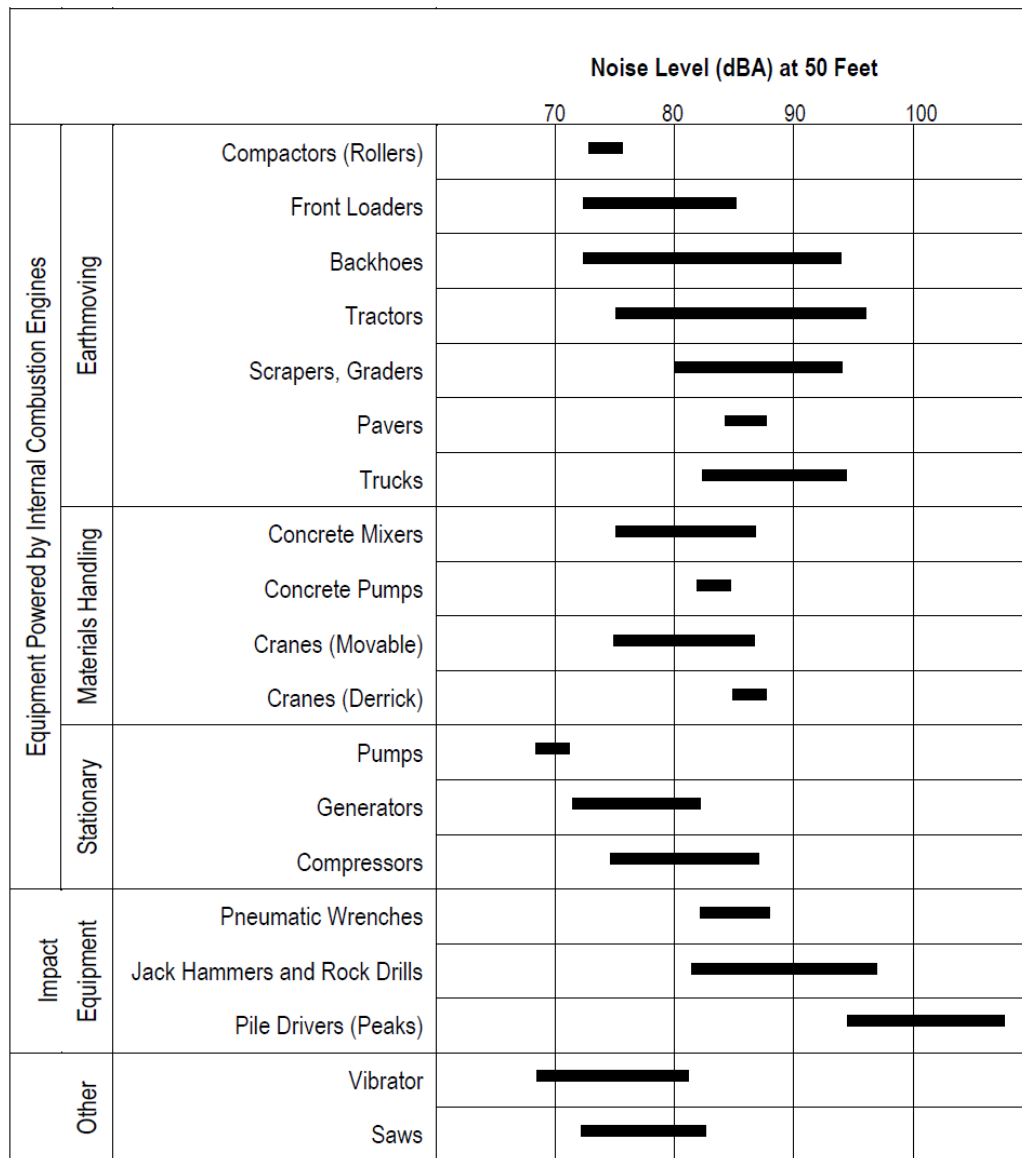
According to the City of Lake Forest Municipal Code, permissible hours of construction are 7 a.m. to 8 p.m. on weekdays and Saturdays. Construction is not permitted on any national holiday or on any Sunday. These hours are included as conditions on any project construction permits and these limits will serve to minimize any adverse construction noise impact potential.

Although construction noise impacts are less-than-significant, and mitigation measures are not required, the following construction practices are recommended to further reduce construction noise levels:

- All mobile equipment should have properly operating and maintained mufflers.
- Haul routes should avoid residential development, where feasible.

Figure 5

Typical Construction Equipment Noise Generation Levels



Source: EPA PB 206717, Environmental Protection Agency, December 31, 1971, "Noise from Construction Equipment and Operations."

CONSTRUCTION ACTIVITY VIBRATION

Typical background vibration levels in residential areas are usually 50 VdB or lower, below the threshold of human perception. Perceptible vibration levels inside residences are typically attributed to the operation of heating and air conditioning systems, door slams or street traffic. Construction activities and street traffic are some of the most common external sources of vibration that can be perceptible inside residences.

Construction activities generate ground-borne vibration when heavy equipment travels over unpaved surfaces or when it is engaged in soil movement. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Vibration related problems generally occur due to resonances in the structural components of a building because structures amplify groundborne vibration. Within the “soft” sedimentary surfaces of much of Southern California, ground vibration is quickly damped out. Groundborne vibration is almost never annoying to people who are outdoors (FTA 2006).

Groundborne vibrations from construction activities rarely reach levels that can damage structures. Because vibration is typically not an issue, very few jurisdictions have adopted vibration significance thresholds. Vibration thresholds have been adopted for major public works construction projects, but these relate mostly to structural protection (cracking foundations or stucco) rather than to human annoyance.

Vibration is most commonly expressed in terms of the root mean square (RMS) velocity of a vibrating object. RMS velocities are expressed in units of vibration decibels. The range of vibration decibels (VdB) is as follows:

65 VdB	-	threshold of human perception
72 VdB	-	annoyance due to frequent events
80 VdB	-	annoyance due to infrequent events
94-98 VdB	-	minor cosmetic damage

To determine potential impacts of the project’s construction activities, estimates of vibration levels induced by the construction equipment at various distances are presented in Table 4.

Table 4
Approximate Vibration Levels Induced by Construction Equipment

Equipment	Approximate Vibration Levels (VdB)*			
	25 feet	50 feet	100 feet	1000 feet
Pile Driver	93	87	81	61
Large Bulldozer	87	81	75	55
Loaded Truck	86	80	74	54
Jackhammer	79	73	67	47
Small Bulldozer	58	52	46	26

* (FTA Transit Noise & Vibration Assessment, Chapter 12, Construction, 2006)

With the exception of pile driving which is not anticipated for use on this project, the on-site construction equipment that will create the maximum potential vibration is a large bulldozer. The stated vibration source level in the FTA Handbook for such equipment is 75 VdB at 100 feet from the source. By 1,000 feet the vibration level dissipates to 55 VdB which is below the threshold of human perception. The nearest existing residential receptor is approximately 1,900 feet from the project site and will not experience any perceptible vibration impacts. There would therefore be no impact on existing residential receptors as a result of construction vibration.

The proposed residential project to the northwest of the site would, when completed, have residential units over 100 feet from the Trumark project site. Should the project to the northwest be constructed prior to the Trumark project, residents of that site could be subject to vibration levels of up to 75 VdB. This is slightly above the threshold for “annoyance due to frequent events” (72 VdB), below the threshold for “annoyance due to infrequent events” (80 VdB), and far below the threshold for “minor cosmetic damage” (94-98 VdB). Bulldozers will only be used for a limited period of time during construction, primarily during the demolition and grading phases, which will last only 40 days. Additionally, vibrations would only be evident during the permissible hours of construction (established by the Municipal Code) of 7 a.m. to 8 p.m. on weekdays and Saturdays. Because vibration impacts would be for only a limited duration during the construction period, and would be below the threshold for “annoyance due to infrequent events” and would not cause cosmetic damage to nearby structures, construction activity vibration impacts on potential new residential development near the site are deemed less-than-significant.

PROJECT-RELATED VEHICULAR NOISE IMPACTS

Long-term noise concerns from the development of residential uses at the project site center primarily on mobile source emissions on project area roadways. These concerns were addressed using the California specific vehicle noise curves (CALVENO) in the federal roadway noise model (the FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108). The model calculates the Leq noise level for a particular reference set of input conditions, and then makes a series of adjustments for site-specific traffic volumes, distances, roadway speeds, or noise barriers. The typical Orange County day-night travel percentages and auto-truck vehicle mixes is then applied to convert one-hour Leq levels to a weighted 24-hour CNEL.

Table 5 summarizes the calculated 24-hour CNEL level at 50 feet from the roadway centerline along project adjacent roadway segments. Three time frames were evaluated; existing conditions with and without project, year 2015 with and without project, and 2030 with and without project. The noise analysis utilized data from the project traffic analysis, prepared in June 2012, by RBF Consulting for this project.

The project itself will not cause any roadway segment to exceed the +3 dB CNEL threshold. The largest project related noise increase is +0.5 dB CNEL at 50 feet from the roadway centerline. This segment is along Towne Centre Drive between Bake Parkway and Auto Center Drive.

Cumulative impacts compare the “future with-project” noise levels with “existing no-project” scenario. The majority of the cumulative increases are attributed to area growth that will occur with or without project implementation. The largest cumulative traffic noise increase is +1.1 dB CNEL again at Towne Centre Drive between Bake Parkway and Auto Center Drive. Therefore, because the cumulative noise impact would not result in any roadway segment exceeding the +3 dB CNEL threshold, both project only traffic noise impacts and cumulative traffic noise impacts are considered to be less-than-significant.

Table 5

**Near-Term Traffic Noise Impact Analysis
(CNEL in dB at 50 feet from Centerline)**

<i>Roadway Segment</i>	<i>Existing</i>	<i>Existing + Project</i>	<i>2015</i>	<i>2015 + Project</i>	<i>2030</i>	<i>2030 + Project</i>
Towne Centre Dr/						
Bake-Auto Center Dr.	66.3	66.3	66.9	67.4	66.9	67.4
Auto Center Drive	66.3	66.3	66.3	66.3	66.3	66.3
Auto Center Dr-Lake Forest Dr.	66.3	66.3	66.9	66.9	66.9	66.9
Portola Parkway/						
E of Bake	71.6	71.8	72.0	72.0	72.5	72.5
W of Lake Forest Dr.	72.0	72.0	72.2	72.2	72.5	72.5
Bake Parkway/						
S of Towne Centre Dr.	73.3	73.3	71.8	71.8	72.2	72.2
Towne Centre to Portola	71.8	71.8	70.6	70.6	70.9	70.9
Lake Forest Dr/						
Rancho Parkway to SR-241	71.3	71.3	70.6	70.6	71.5	71.5
S of Towne Centre Dr.	70.6	70.6	69.9	69.9	70.6	70.6
Towne Centre to Portola	69.3	69.3	69.0	69.0	69.6	69.6

**Project-Related Noise Impact
(CNEL in dB at 50 feet from Centerline)**

<i>Roadway Segment</i>	<i>Project Only Impact Existing</i>	<i>Project Only 2015</i>	<i>Project Only 2030</i>	<i>Cumulative Impact</i>
Towne Centre Dr/				
Bake-Auto Center Dr.	0.1	0.5	0.5	1.1
Auto Center Drive	0.0	0.0	0.0	0.0
Auto Center Dr-Lake Forest Dr.	0.0	0.0	0.0	0.6
Portola Parkway/				
E of Bake	0.2	0.0	0.0	0.8
W of Lake Forest Dr.	0.0	0.0	0.0	0.5
Bake Parkway/				
S of Towne Centre Dr.	0.0	0.0	0.0	-1.1*
Towne Centre to Portola	0.0	0.0	0.0	-1.0*
Lake Forest Dr/				
Rancho Parkway to SR-241	0.0	0.0	0.0	0.2
S of Towne Centre Dr.	0.0	0.0	0.0	0.0
Towne Centre to Portola	0.0	0.0	0.0	0.3

*Alton Parkway extension, which adds parallel capacity, is expected to relieve Bake Parkway congestion and reduce noise levels.

ON-SITE NOISE EXPOSURE

Exterior Noise Levels

Residential recreational area traffic noise exposures are calculated at areas of probable use (patio, balcony, etc.). Receiver building locations for the residential unit closest to any roadway were selected for analysis and were compared to built-out traffic projections found in the project traffic report as shown in Table 6.

Table 6
Predicted Traffic Noise Levels at Perimeter Roadways (dB CNEL) at Build-Out (2030)

Roadway	Future Noise Level at 50 feet to Centerline	Future Façade Noise Loading
Auto Center Drive	58	<58
Towne Centre Drive	66	65
<i>General Plan Noise Standard: 65 dB</i>		

The closest building façade is approximately 65 feet to the Towne Centre Drive centerline. Moderate volumes of traffic on Towne Center Drive as well as building setback provide for a noise level equal or below the recommended 65 dB CNEL at any patio or deck along the Towne Center Drive or Auto Center Drive frontage. Noise levels for recreational uses within the project would not exceed the City of Lake Forest exterior noise standard of 65 dB CNEL.

Existing CNEL noise levels near the Mercedes dealership were shown to be between 57 to 59 dB and are well within the compatibility guidelines for residential use. No noise mitigation is necessary.

Interior Noise Levels

Maximum exterior to interior attenuation of 20 dB will be required to meet the interior standard in habitable rooms with Towne Center Drive frontage. For typical wood-framed construction with stucco and gypsum board wall assemblies, the noise level reduction is as follows:

Partly open windows – 12 dB

Closed single paned windows – 20 dB

Closed dual-paned windows – 30 dB

Use of dual-paned windows is required by code for energy conservation in new residential construction. Interior noise standards will be met with a large margin of safety as long as the option exists to close windows facing the street. It is noted that where window closure is a requirement for interior noise control, the Building Code requires provision of supplemental ventilation at a specified rate with a specified fraction of fresh make-up air. The provision of supplemental ventilation is a standard construction practice.

ON-SITE NOISE IMPACTS FROM MERCEDES DEALERSHIP

As shown in Table 3, the CNEL along the project boundary with the existing Mercedes Dealership is less than 58 dB and the hourly Leqs are not greater than 56 dB. However, the noise standards presented in Table 2 contain an Lmax threshold as well as for 5, 15 and 30 minutes. Therefore, these parameters were evaluated as well as shown below:

Time Interval	Lmax	5 minute max	15 minute max	30 minute max
15:00-16:00	67.6	52.9	46.1	46.1
16:00-17:00	69.6	55.9	51.9	46.1
17:00-18:00	65.7	56.8	52.9	52.9
18:00-19:00	61.8	51.9	46.1	46.1
19:00-20:00	64.7	51.9	46.1	46.1
20:00-21:00	56.8	46.1	46.1	45.1
21:00-22:00	66.7	46.1	46.1	46.1
22:00-23:00	68.6	46.1	45.1	45.1
23:00-24:00	56.8	46.1	44.1	43.1
0:00-1:00	51.9	44.1	43.1	42.1
1:00-2:00	46.1	43.1	41.2	40.2
2:00-3:00	46.1	41.2	40.2	39.2
3:00-4:00	64.7	44.1	43.1	42.1
4:00-5:00	58.8	46.1	45.1	44.1
5:00-6:00	64.7	52.9	51.9	46.1
6:00-7:00	71.6	60.8	54.9	52.9
7:00-8:00	76.5	69.6	60.8	58.8
8:00-9:00	70.6	60.8	55.9	53.9
9:00-10:00	70.6	56.8	46.1	46.1
10:00-11:00	58.8	51.9	46.1	45.1
11:00-12:00	68.6	58.8	54.9	52.9
12:00-13:00	79.4	58.8	55.0	54.9
13:00-14:00	69.6	57.8	53.9	52.9
14:00-15:00	72.5	56.8	52.9	51.9
<i>Not To Exceed Daytime Standard</i>	75	70	65	55
<i>Not To Exceed Nocturnal Standard</i>	70	65	55	50
Note: Values in bold exceed noise standards. Shaded boxes indicate hours subject to nocturnal noise standards.				

The nocturnal noise ordinance standard is exceeded from 6-8 a.m., and from 12 noon -1 p.m. for the Lmax threshold and from 6-8 a.m. for the 30-minute criterion. These levels are presumed to be due to ambient traffic (during the morning rush hour and the early afternoon lunch hour) and not the dealership. All sustained (5-, 15- or 30-minute) noise levels are below the daytime standard during hours of dealership operations even with the inclusion of background traffic noise. Placement of residences on the site will not create a noise constraint upon dealership sales or maintenance activities.

ON-SITE NOISE IMPACTS FROM THE VILLAGE COMMERCIAL CENTER

The proposed plan would also place residential units across the street from commercial activities at the Village Commercial Center. The closest project site homes would be approximately 200 feet from the nearest center building. However, the types of commercial uses closest to the proposed Paseos are not inherently noise-generating (two restaurants, a barber shop, a neighborhood market, a dry cleaners shop, and two current vacancies). These facilities have no outdoor seating, they do not offer entertainment, and deliveries by vendors are to rear doors of each unit shielded from project view by the commercial building itself. Any audibility would possibly be from parking lot activities (door slams, engine start-ups, alarm chirps). These sources will be attenuated by 200+ feet of distance separation and will be masked by background traffic noise from Towne Centre and Auto Center Drives. Ground floor noise exposure within the Paseos site may also be reduced by any project perimeter privacy/security walls.

NOISE IMPACT MITIGATION

As described above, short-term construction noise intrusion and vibration impacts are judged to be less-than-significant with implementation of standard conditions on construction permits requiring compliance with the City of Lake Forest Noise Ordinance. The allowed hours of construction are 7 a.m. and 8 p.m. on weekdays and Saturdays. Construction is not permitted on any national holiday or on any Sunday. No mitigation measures are required to reduce impacts from construction-period noise or vibration.

Outdoor recreational area noise exposures for all perimeter units backing up to Towne Centre Drive or Auto Center Drive will be 65 dBA CNEL or less which is the City of Lake Forest standard for usable outdoor space. No mitigation is required. If subdivision walls are included for privacy, their noise reduction benefit will create a substantial extra margin of safety.

Closure of windows in habitable rooms with a direct line-of-sight of Towne Centre or Auto Center Drives will be necessary to meet the City's 45 dBA CNEL interior noise standard. The Building Code requires the provision of supplemental fresh make-up air if windows must be closed to shut out roadway noise. This is a standard construction procedure and no supplemental mitigation measure is required.

The project noise impact study indicates a less-than-significant noise impact from project-related traffic on project vicinity receptors. Project-related traffic will not cause noise standards to be exceeded, nor make substantially worse any existing violations.

Existing off-site commercial activities will not create noise constraints on proposed residential use of the project site. Measurement results show that existing commercial uses do not generate levels of noise that would trigger new noise limitations on their activities created by the presence of new nearby residential occupancy. The proposed site conversion to residential use thus would not engender any noise mitigation requirements with respect to existing commercial uses.